

# The Macropodoids (Marsupialia) of the early Pliocene Bow Local Fauna, Central Eastern New South Wales

T. F. FLANNERY AND M. ARCHER

School of Zoology, University of New South Wales, Kensington, N.S.W. 2033.

## ABSTRACT

Sixteen kinds of macropodoids, including macropodines, sthenurines, potorines and hypsiprymnodontines, can be recognised in the early Pliocene Bow local fauna of the Hunter Valley in central eastern New South Wales. Of these, seven can be identified to species (*Propleopus* n. sp., *Troposodon bowensis* Flannery and Archer, 1983, *Kurrabi mahoneyi* n. sp., *Kurrabi merriwaensis* n. sp., *Protemnodon chinchillaensis* Bartholomai, 1973, *Macropus dryas* DeVis, 1895 and *Macropus (Osphranter) pavana* Bartholomai, 1978) a further two or three confidently to genus (*Simosthenurus* sp. and *Troposodon* sp., one or two species).

The majority of Bow macropodids possess moderately hypsodont molars, often with elongate, trenchant premolars. This suggests a woodland and/or savanna environment. There are, however, a few Bow species with brachydont molars (i.e., cf. *Dendrolagus* spp. that may have been derived from a rainforest habitat. The closest affinities of the Bow kangaroos seem to lie with kangaroos from the early Pliocene Hamilton and Bluff Downs local faunas and, more distantly, with those of the early to middle Pliocene Chinchilla local fauna. Thus, Skilbeck's (1980) preliminary assessment of the age of the Bow local fauna as early Pliocene (4-4.5mybp) is supported.

## INTRODUCTION

A preliminary report by Skilbeck (1980) describes the geology and fossil fauna of the Bow locality of the Hunter Valley, New South Wales. The fossils occur in fluvial sediments exposed in a road cutting. Bones from the locality are most often fragmented and almost never associated (an exception may be the holotype and a referred specimen of *Kurrabi mahoneyi* n. sp.). Skilbeck suggests that the site represents an ephemeral gully facies. At the time of Skilbeck's review, only six species of Bow macropodoids were recognised: *Propleopus* sp.; *Macropus (Osphranter)* sp. cf. *M. (O.) woodsi* (here recognised as *M. (O.) pavana*); *Protemnodon chinchillaensis*; *Troposodon* sp. cf. *T. bluffensis* (later described by Flannery and Archer 1983 as *T. bowensis*); *Sthenurus* sp. (here recognised as *Simosthenurus* sp.); and an unnamed genus (here recognised as a new macropodine genus, *Kurrabi*, containing two new species, *K. mahoneyi* and *K. merriwaensis*). Skilbeck (1980) also noted the presence of gastropods, bivalves, crustaceans, chelonians, *Dasyurus* sp., *Phascolonus* sp., *Thylacoleo crassidentatus*, *Palorchestes* sp. cf. *P. parvus* and a nototheriine. Subsequently, Archer (1982)

recognised *Dasyurus dunmalli* (*Dasyurus* sp. of Skillebekk), and Archer and Dawson (1982) recognised *Thylacaleo* sp. cf. *T. hilli* in the Bow local fauna.

Dental homology and terminology follows Archer (1976, 1978). AM F is a prefix for fossil specimens held in the Australian Museum (Sydney). The registration numbers of all macropodoid dental fragments from Bow not mentioned in the text or in other publications are given in Appendix 1. Pledge (1980) is followed in recognising *Shenurus* and *Simosthenurus* as separate genera.

## SYSTEMATICS

### SUPERFAMILY MACROPODOIDEA (GRAY, 1821)

#### FAMILY POTOROIDAE GRAY, 1821

#### SUBFAMILY HYPSPRYMNODONTINAE COLLETT, 1887

#### *Propleopus* Longman, 1924

#### *Propleopus* sp.

A new species of *Propleopus* from the Bow local fauna, represented by a dentary, is presently being described by W. D. L. Ride and J. A. Mahoney (J. Mahoney pers. comm.).

#### SUBFAMILY POTOROINAE (GRAY, 1821)

#### Genus indet.

#### (Figure 1D,E)

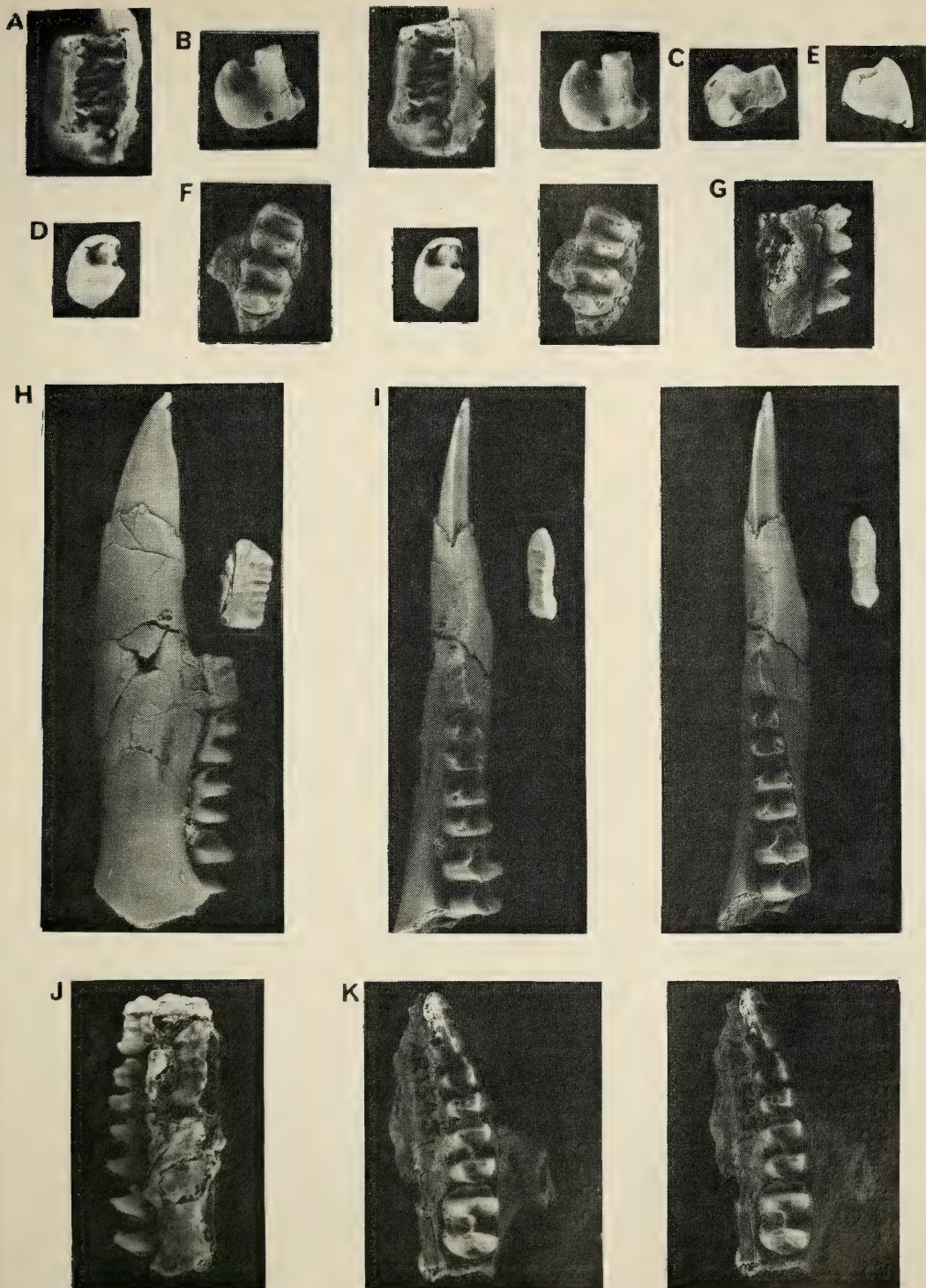
*Material.* A single molar fragment from Bow, AM F64003, probably the hypoloph of a right M<sup>4</sup>, represents a potoroine.

*Description.* The tooth fragment is relatively high-crowned and its lingual margin slopes at a low angle to the base of the crown relative to that seen in most other potorooids. The pre- and posthypocristae are strongly-developed, the latter forming a continuous posterior cingulum by joining the postmetacrista. There is a slight premetacrista. The hypoloph is weakly-developed.

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Fig. 1. A, stereopair of occlusal view of AM F64002, right P<sup>3</sup> fragment of *Simosthenurus* sp., X2. B, stereopair of occlusal view of AM F64004, posterior portion of right P<sub>3</sub> of *Dendrolagus* sp., X2. C, lingual view of same specimen, X2. D, stereopair of occlusal view of AM F64003, hypoloph of right M<sup>4</sup> of a potoroine, X2. E, posterior view of same specimen, X2. F, stereopair of occlusal view of AM F64007, M<sup>3,4</sup> of cf. *Dendrolagus*, X1. G, lingual view of same specimen, X1. H, lingual view of holotype of *Kurrabi mahoneyi* (AM 64016), left dentary containing P<sub>3</sub>, P<sub>3</sub> (removed from crypt), M<sub>1-3</sub>, X1. I, stereopair of occlusal view of the same specimen, X1. J, lingual view of AM F64020, juvenile left maxillary fragment containing P<sup>2</sup>, P<sup>3</sup> (in crypt), M<sup>1-3</sup> of *Kurrabi mahoneyi*, X1. K, stereopair of occlusal view of same specimen, X1.





*Discussion.* This fragment resembles upper molars of an unnamed genus of potoroine of the Hamilton local fauna in being high-crowned and in possessing lingual upper molar margins that slope at a low angle to the base of the crown (Flannery *et al.* in prep.). However, the Bow specimen is smaller than the Hamilton form and, on the basis of this evidence alone, the two are probably not conspecific. In being high-crowned, the Bow specimen also resembles *Aepyprymnus rufescens*. It differs from *A. rufescens*, however, in lacking the extremely well-developed posthypocrista that forms most of the posterior cingulum of the upper molars of the latter species.

FAMILY MACROPODIDAE GRAY, 1821  
SUBFAMILY STHENURINAE (GLAUERT, 1926)  
*Simosthenurus* Tedford, 1967  
*Simosthenurus* sp.  
(Figure 1A)

*Material.* A species of *Simosthenurus* is represented in the Bow local fauna by two specimens, a P<sup>3</sup> fragment (AM F64002) and a lower molar (AM F60670).

*Diagnostic features.* These specimens have been assigned to the genus *Simosthenurus* for the following reasons. Only species of *Sthenurus*, *Simosthenurus* and *Procoptodon* among macropodoids possess a P<sup>3</sup> with a very high lingual cingulum and with many tall enamel ridgelets in the valley between the main blade and the lingual cingulum. These characteristics are seen in the Bow premolar fragment (see Fig. 1A). The molars of the species of *Sthenurus* are higher-crowned and have less crenulate enamel than the Bow specimen, while the molars of the species of *Procoptodon* are higher-crowned and often possess fissures in the hypolophid, characteristics that the Bow premolar lacks. The molars of species of *Simosthenurus* resemble the Bow molar in being low-crowned and in possessing crenulate enamel.

*Description.* Unfortunately, the *Simosthenurus* molar from Bow can no longer be located. The premolar fragment consists of the posterolingual moiety of the tooth (see Fig. 1A). The low posterolingual cusp does not join directly to the main crest. The lingual cingulum, although high, is noticeably lower than the main crest, the full height of which may not be preserved. The valley between the lingual cingulum and the main crest is broad and is crossed by many anastomosing enamel ridgelets.

*Discussion.* The Bow P<sup>3</sup> fragment differs from the single known P<sup>3</sup> of *Simosthenurus antiquus* (the only Pliocene *Simosthenurus* named so far) in the following ways: The posterior-most part of the valley separating the main crest and the lingual cingulum is ornamented with anastomosing ridges rather than longitudinally oriented striae such as occur in *S. antiquus* where the more anterior part of the valley is filled with many more, higher anastomosing ridgelets. The P<sup>3</sup> of *Sthenurus notabilis* (the only Pliocene species of *Sthenurus*) is not known.



*Troposodon* Bartholomai, 1967

*Troposodon bowensis* Flannery and Archer, 1983

Flannery and Archer (1983) noted the presence of two or three species of *Troposodon* in the Bow local fauna. A small primitive species, *Troposodon bowensis*, is the most abundant marsupial at the site.

*Troposodon* spp.

Several *Troposodon* specimens found at the Bow locality are from larger species than *T. bowensis*. They may represent extreme variants of *T. minor* or one or two unnamed forms (Flannery and Archer 1983).

SUBFAMILY MACROPODINAE (GRAY, 1821)

*Dendrolagus* Muller, 1839

cf. *Dendrolagus* sp. 1

(Figure 1B,C)

*Material.* The posterior fragment of a right P<sup>3</sup>, AM F64004, may represent a small species of *Dendrolagus* at Bow.

*Diagnostic features.* This specimen is tentatively assigned to the genus *Dendrolagus* because, apart from species of *Sthenurus*, *Simosthenurus* and *Procoptodon*, the species of *Dendrolagus* are the only macropodoids known to develop a postero-buccal cusp on P<sup>3</sup>. Species of *Dendrolagus* can be distinguished from species of the above three sthenurine genera by being much smaller, possessing a lower lingual cingulum on P<sup>3</sup>, and in having the valley between the main crest and the lingual cingulum with far fewer (and much weaker) enamel ridgelets.

*Description.* The P<sup>3</sup> fragment consists of the posterior portion of the main blade. lingual cingulum and a postero-buccal and posterolingual cusp. A single small cuspule and associated groove are preserved on the remaining portion of the straight main blade anterior to the large posterior cusp. The postero-buccal cusp is situated at the posterior end of the tooth. It is two-thirds the height of the main blade and is fused to it for its entire height. The posterolingual cusp is broad and blade-like. Between it and the main blade, posteriorly, there is a small but deep circular posterior fossette. The posterolingual cusp merges into the lingual cingulum to form a broad sweeping crest that converges on the main blade anteriorly to the point at which the tooth is broken away (see Fig. 1B,C).

*Discussion.* This tooth fragment closely resembles P<sup>3</sup> fragments assigned to cf. *Dendrolagus* sp. from the Hamilton local fauna (Flannery *et al.* in prep.). It differs from the Hamilton specimens in being more worn, slightly larger and in having the posterolingual cusp more continuous with the lingual cingulum. All of these fragments most closely resemble the P<sup>3</sup> of *Dendrolagus bennettianus* among living tree kangaroos. They differ, however, in being much smaller and in having a relatively smaller postero-buccal cusp (see Table 1). On the basis of their extremely fragmentary remains, the Hamilton and Bow specimens of cf. *Dendrolagus* may be conspecific.

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TABLE 1. Dental measurements for some species of macropodids from the Bow local fauna. All measurements are in mm. L = length, AW = anterior width, PW = posterior width.

			L	AW	PW
Potorinae indet	F 64003	M <sup>4</sup>			5.2
cf. <i>Dendrolagus</i> sp. 1	F 64004	P <sup>3</sup>			6.2
cf. <i>Dendrolagus</i> sp. 2	F 64007	M <sup>3</sup>	7.8	6.7	6.5
		M <sup>4</sup>	8.5	6.8	6.5
<i>Protemnodon chinchillaensis</i>	F 59533	P <sup>3</sup>	18.8	7.8	9.3
		M <sup>2</sup>	10.2	10.3	10.6
		M <sup>3</sup>	12.0	11.1	10.6
	F 59530	M <sup>2</sup>	10.6	10.3	10.4
		M <sup>3</sup>	12.2	11.1	11.0
		M <sup>4</sup>	13.2	11.5	10.5
		M <sup>5</sup>	13.3	10.9	8.7
	F 59606	M <sup>3</sup>	11.0		
		M <sup>4</sup>	12.5		
	F 64034	P <sub>3</sub>	16.0	7.0	6.3
		M <sub>3</sub>	11.6		
		M <sub>4</sub>	13.8	10.8	10.7
		M <sub>5</sub>	14.8	10.8	9.7
	F 59537	M <sub>3</sub>	13.7	9.4	9.0
	F 59549	M <sub>2</sub>	12.3		8.2
<i>Macropus dryas</i>	F 59535	P <sup>2</sup>	7.9	4.2	5.1
		P <sup>3</sup>	12.2	3.8	5.7
		M <sup>1</sup>	8.3	6.0	6.2
		M <sup>2</sup>	8.7	7.0	7.0
		M <sup>3</sup>	10.5	7.9	7.5
	F 64065	M <sup>2</sup>	9.4	7.2	7.6
	F 64064	M <sup>3</sup>	10.4	8.4	7.8
	F 59546	M <sub>2</sub>	8.1		6.1
		M <sub>3</sub>	11.5	7.1	7.3
		M <sub>4</sub>			8.2
<i>Macropus (Osphranter) pavana</i>	F 59532	M <sup>3</sup>	11.3	9.8	
		M <sup>4</sup>	12.8	10.4	9.9
	F 59536	M <sup>4</sup>	13.6	10.2	
		M <sup>5</sup>	14.6	11.4	10.6
	F 59573	P <sub>3</sub>	9.6		
		M <sub>1</sub>	10.2		
	F 64033	P <sub>3</sub>	8.8	3.4	4.7
		M <sub>1</sub>	9.6	5.5	11.7
		M <sub>2</sub>	11.1	7.3	7.8
		M <sub>3</sub>	12.4	8.4	8.1
	F 59534	P <sub>3</sub>	8.8	3.6	4.7
		M <sub>3</sub>	14.0		
	F 59548	M <sub>3</sub>	11.0		
		M <sub>4</sub>	15.2	9.0	9.0
<i>Macropus (Osphranter) pavana</i>	F 59585	M <sub>3</sub>	13.0	8.4	
		M <sub>4</sub>		9.3	
		M <sub>5</sub>			8.0
	F 64055	M <sub>5</sub>	15.4	9.6	8.6
Macropodinae Indet. 1	F 64001	M <sub>3</sub>	9.5		
Macropodinae Indet. 2	F 64008	M <sub>3</sub>		4.0	
	F 64010	molars			4.0
	F 64009	lower			3.4



cf. *Dendrolagus* sp. 2

(Figure 1F,G)

*Material.* A maxillary fragment containing  $M^{3-4}$  (AM F64007) and an isolated  $M^5$  (AM F59576) are probably referable to a large *Dendrolagus*-like animal.

*Diagnostic features.* These molars clearly belong to a brachydont, primitive macropodine and are very similar to those of some species of *Dendrolagus*. They are too large to belong with the previously described premolar fragment tentatively assigned to *Dendrolagus*. While superficially resembling the molars of the species of *Dorcopsis*, they differ in lacking a forelink, in having a much weaker postparacrista and premetacrista, in having slightly broader interloph valleys and in being slightly more elongate. They are similar in size to the molars of a maxillary fragment referred by Plane (1967) to *Dorcopsis* sp. from the Pliocene Awe local fauna of New Guinea, from which they differ mainly in having weaker postparacristae and premetacristae. This same characteristic and superior size distinguish the Bow fossils from *Dendrolagus dorianus* and *D. goodfellowi*. Apart from their superior size, they most closely resemble the upper molars of *D. bennettianus* and *D. lumboltzi*. Because *Bobra paulae* Flannery and Szalay, 1982, a gigantic primitive tree-kangaroo from Pleistocene deposits in Wellington Caves, New South Wales, is known only from postcranial remains, these two forms cannot be compared. However, both are of large size and primitive morphology.

*Description.* The maxillary fragment is poorly-preserved. The base of the masseteric process can be distinguished but its size cannot be determined. It is situated above the anterior end of  $M^4$ . A part of the alveolus of the posterior root of  $M^2$  and of the anterior root of  $M^5$  are preserved.

The  $M^3$  is only slightly-worn and is low-crowned. The hypoloph and protoloph are subequal in width. The anterior cingulum extends across the width of the tooth. A moderately strong preparacrista connects the paracone to the lingual side of the anterior cingulum. There is no forelink and the midlink is very poorly-developed. The interloph valley is shallow but with a narrow base. There is a strong postparacrista, premetacrista and posthypocrista, but a weaker postmetacrista. The posthypocrista swings buccally to join the almost vertical postmetacrista. The  $M^4$  differs from  $M^3$  in the following ways: it is larger; a slight postprotocrista runs to join the midlink near the centre of the posterior of the protoloph; the posthypocrista is less well-developed. The  $M^5$  differs from  $M^4$  in being broader and is obviously from a different individual. The hypoloph is narrower than the protoloph, and the interloph valley seems to be slightly broader than on  $M^4$  (see Fig. 1F,G).

*Discussion.* This taxon is of little stratigraphic or taxonomic use at present as it is so poorly-known and does not match closely any named species. However it does provide further evidence for a brachydont macropodid element in the Bow local fauna.

*Kurrabi* n. gen.Type species: *Kurrabi mahoneyi* n. gen. and sp.

**Generic diagnosis.** Species of *Kurrabi* can be distinguished from other macropodoids as follows. They differ from potoroids (except bulungamayines) in possessing lophodont molars. They can be distinguished from bulungamayines by lacking highly bulbous, finely-grooved premolars, masseteric canal extending to below  $P^3$  and a convex ventral margin of the dentary below the middle part of the molar row. They can be distinguished from sthenurines by lacking a prominent postlink on the upper molars and a well-developed premetacristid. They can be distinguished from the species of *Dorcopsis*, *Dorcopsulus* and *Dendrolagus* by possessing a broad, well-formed protolophid on  $M_1$ , having a  $P^2$  with a prominent posterolingual cusp and in possessing higher-crowned molars with better-developed links. They can be distinguished from *Hadronomas puckridgi* by possessing higher-crowned molars with better-developed links and in having less strongly ridged and less bulbous premolars. They differ from species of *Macropus* and *Onychogalea* by lacking an arched alveolar margin to the lower molar row and in having much more elongate premolars which are retained throughout life. They can be distinguished from the species of *Dorcopsoides*, *Prionotemnus palankarinnicus* and the species of *Protemnodon* (except some *P. roechus*) in lacking a posterior cingulum on the lower molars. They differ from *P. roechus* by possessing higher-crowned, more elongate molars, in being smaller in size and in lacking a specialised, spatulate-like  $I_1$ . They differ from *Setonix brachyurus* in possessing higher-crowned molars, having a non-fenestrate palate and in having a weaker lingual cingulum on  $P^3$ . They differ from the species of *Thylogale*, *Petrogale*, *Lagorchestes* and *Macropus* wallabies in having a non-fenestrate palate and in being larger in size. The diastema of the dentary is relatively longer and the protolophid of  $M_1$  wider than in the species of *Lagorchestes*. They differ from all *Macropus* wallabies in possessing lower-crowned molars with less convex hypolophid rear faces and (except *M. agilis*) in possessing proportionately much longer premolars. They can be distinguished from the species of *Wallabia* by possessing weaker pre- and post-metacristae on the upper molars and by possessing a non-fenestrate palate.

**Etymology.** *Kurrabi* is a New South Wales Aboriginal word for gully (McCarthy 1971), a reference to the postulated depositional environment of the Bow local fauna.

**Discussion.** The relationships of the species of *Kurrabi* are at present unclear. The closest affinities seem to lie with a group of macropodines including the species of *Protemnodon*, *Wallabia* and some *Macropus*. All of these forms possess moderately hypsodont molars and elongate, permanent premolars. A thorough cladistic analysis of the Macropodinae (in progress) should enable a better understanding of the nearest relatives of the otherwise distinctive species of *Kurrabi*.

Species of *Kurrabi* are restricted in distribution, being known only from the Bow and Hamilton local faunas (Flannery *et al.* in prep.). However, where they



occur, they are abundant. For example, *Kurrabi maboneyi* is the second and *K. merriwaensis* the third most abundant macropodoids in the Bow local fauna.

*Kurrabi maboneyi* n. sp.  
(Figures 1H-K and 2; Table 2)

*Holotype.* AM F64016, partial left dentary containing  $I_1$ ,  $P_{2-3}$  and  $M_{1-3}$ , which is broken away posterior to  $M_3$ .

*Referred specimens.* AM F64018, right dentary containing  $I_1$ ,  $P_2$ ,  $M_{1-2}$  (judging from wear patterns, stage of eruption of molars and preservation, this specimen may be from the same individual as the holotype). AM F60114, left dentary fragment containing  $P^2$ ,  $P^3$ ,  $M^{1-3}$ . AM F64019, right maxillary fragment containing  $M_{2-5}$ . AM F64022, right dentary fragment containing  $M_{2-5}$ . AM F64024, left dentary fragment containing  $P_3$ ,  $M_2$ . AM F59572, left dentary fragment containing partial  $P_3$ ,  $M_1$ , complete  $M_{2-4}$ . AM F59561, right dentary fragment containing  $P_3$ . AM F59577, left  $P_3$  fragment. AM F64029, left  $M_1$ . AM F64028 and AM F64031, left  $P_3$  fragments. AM F59603, right maxillary fragment containing  $P^3$ ,  $M^{2-5}$ . AM F64023, left maxillary fragment containing  $P^3$ ,  $M^{2-5}$ . AM F64020, left maxillary fragment containing  $P^2$ ,  $P^3$ ,  $M^{1-3}$ . AM F64019, right maxillary fragment containing  $P^3$  fragment,  $M^{1-2}$ . AM F59562 and AM F64030, left  $P^3$ 's. AM F64026, right  $P_3$ . AM F64027, right  $P^3$  fragment. AM F64025, left  $P^3$  fragment.

*Diagnostic features.* *Kurrabi maboneyi* can be distinguished from *K. merriwaensis* n. sp. in possessing more elongate premolars, less well-developed post-paracristae and premetacristae on the anterior molars and a better-developed premetacristid on  $M^1$  which reaches the anterior part of the anterior cingulum. Also the  $P^3$  of *K. maboneyi* possesses three small cuspules between the anterior and posterior cusps, while that of *K. merriwaensis* usually possesses only two.

*Type locality and age.* All specimens were recovered from a road cutting on the Merriwa-Cassilis Road, 500 m west of Bow Creek, 12 km west of Merriwa, New South Wales (Grid reference 323033 on 1:250,000 geological sheet for Singleton, No 51-56-1, New South Wales Department of Mines, Sydney). The Bow local fauna is generally believed to be early Pliocene in age (Skilbeck 1980).

*Etymology.* This species is named in honour of J. A. Mahoney who was instrumental in the initial investigation of the Bow fossil locality and who subsequently collected much of the material described here.

*Description.* Maxilla. The palate appears to have been non-fenestrate. The prominent masseteric process is present composed solely of the maxillary. The position of the infraorbital foramen cannot be determined.

The  $P^2$  is elongate and possesses a main crest composed of an anterior and posterior cusp with a single strong ridge between. A distinct posterobuccal cusp, which is lower than the main crest, joins it by two ridges, one running directly to the posterior cusp and the other running posterobuccally to join it more

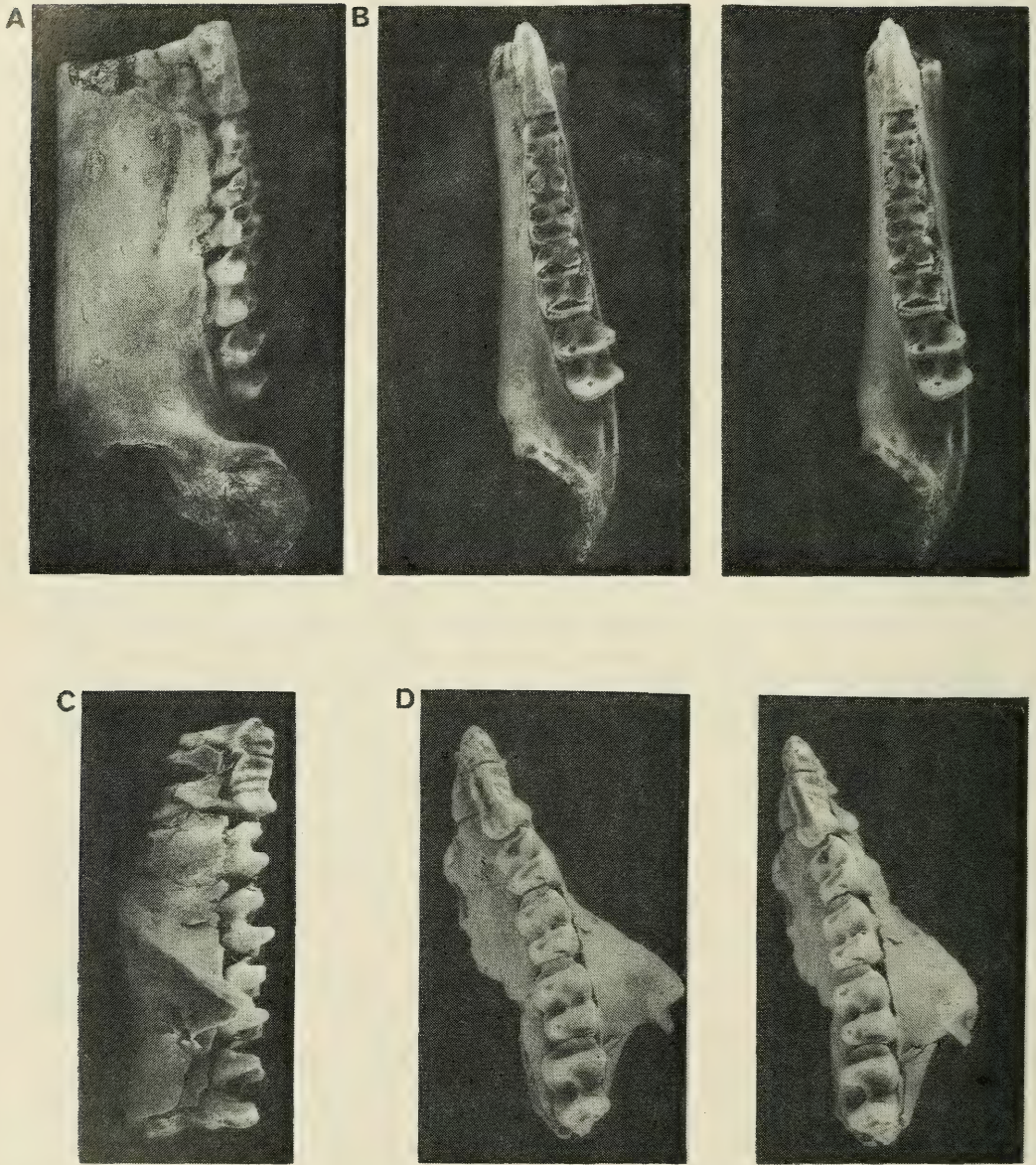


Fig. 2. A, lingual view of AM F60114, adult left dentary of *Kurrabi mahoneyi*, X1. B, stereopair of occlusal view of same specimen, X1. C, lingual view of AM F59603, adult right maxillary fragment of *K. mahoneyi* containing P<sup>3</sup>, M<sup>2-5</sup>, X1. D, stereopair of same specimen, X1.



## PLIOCENE KANGAROOS FROM THE BOW LOCAL FAUNA, N.S.W.

 TABLE 2. Dental measurements of *Kurrabi mahoneyi* n. sp. from the Bow local fauna. Measurements are in mm. X = mean, R = range, L = length, AW = anterior width, PW = posterior width, STD = standard deviation, N = number.

		X	R	STD	N
P <sup>2</sup>	L	10.3			1
	AW	4.2			1
	PW	4.5			1
P <sup>3</sup>	L	15.5	15.1-16.2	.52	6
	AW	4.7	4.2- 5.2	.29	6
	PW	6.5	6.0- 6.9	.37	6
M <sup>1</sup>	L	8.5	8.5		2
	AW	6.1	6.0- 6.2		2
	PW	6.4	6.3- 6.4		2
M <sup>2</sup>	L	9.1	8.4-10.0		4
	AW	7.2	6.9- 7.4		4
	PW	7.1	6.8- 7.6		4
M <sup>3</sup>	L	10.0	9.4-10.5		3
	AW	7.9	7.7- 8.0		2
	PW	7.4	7.4		2
M <sup>4</sup>	L	10.8	10.6-10.9		2
	AW	8.5	8.4- 8.6		2
	PW	7.9	7.8- 7.9		2
M <sup>5</sup>	L	11.2	11.2		2
	AW	8.5	8.4- 8.5		2
	PW	7.2	7.0- 7.3		2
P <sub>2</sub>	L	8.4	8.3- 8.4		2
	AW	3.4	3.3- 3.5		2
	PW	3.8	3.6- 4.0		2
P <sub>3</sub>	L	12.8	11.9-13.2	.51	5
	AW	4.0	3.8- 4.3	.21	5
	PW	4.0	3.9- 4.2	.11	7
M <sub>1</sub>	L	8.2	8.1- 8.4		3
	AW	4.2	4.0- 4.3		3
	PW	5.0	4.8- 5.2		4
M <sub>2</sub>	L	9.3	8.7-10.3		3
	AW	5.7	5.5- 6.0		3
	PW	5.9	5.5- 6.2		3
M <sub>3</sub>	L	10.0	9.1-11.0	.72	5
	AW	6.6	6.2- 7.0		2
	PW	6.5	6.5		2
M <sub>4</sub>	L	10.5	10.1-10.9		3
	AW	7.6	7.4- 7.8		2
	PW	7.7	7.7		2
M <sub>5</sub>	L	12.2	11.9-12.5		3
	AW	7.9	7.7- 8.1		3
	PW	7.1	6.9- 7.3		3

posteriorly. These ridgelets enclose a posterior fossette. A well-developed lingual cingulum is present on the posterior two-thirds of the tooth with low tubercles continuing further anteriorly than this.

The P<sup>3</sup> is a large tooth relative to molar size. The main crest is composed of an anterior and posterior cusp with three distinct cuspsules and associated

ridgelets between. The distinct posterolingual cusp is lower than the main crest and is joined to it by two ridges, one running directly to the main crest and the other (lower) ridge running around the posterior border of the tooth. These ridges enclose a posterior fossette. The continuous, low lingual cingulum extends two-thirds to three-quarters of the length of the tooth from the posterior margin with one or two tubercles continuing further anteriorly. These end opposite the anterior cusp. The  $P^3$  is slightly constricted one-third of the way from the posterior end of the tooth.

Upper molars. The anterior cingulum of  $M^1$  is connected to the paracone buccally by a prominent preparacrista. Lingually the anterior cingulum fuses with the base of the protoloph anterior to the apex of the protocone. A slight forelink may be present (as in AM F64019). The protoloph is weakly-formed. The protocone and, to a greater extent, the paracone form distinct prominences on the protoloph. The postparacrista is strongly-developed and a weaker premeracrista is present. The midlink originates at the apex of the protocone and extends across the narrow interloph valley to terminate against the anterior face of the hypoloph between the hypocone and the metacone. The metacone and, to a lesser extent, the hypocone form distinct prominences on the hypoloph. The posthypocrista is well-developed and unites with a much less well-developed, near-vertical postmetacrista. A slight postlink is present. The  $M^2$  differs from  $M^1$  in the following ways: it is larger; the pre- and postparacrista are greatly reduced in strength; the premetacrista is absent; the anterior cingulum appears to be more restricted lingually; the protoloph is better-developed and the cones are of a more equal height; a postlink is absent; the midlink has a distinct fissure near its posterior end suggesting that the posterior moiety is a contribution from the hypoloph and the anterior portion is from the postprotocrista (this area is obscured by wear on  $M^1$ ). The  $M^3$  differs from  $M^2$  in being larger and in having the pre- and postparacristae and the posthypocrista further reduced.  $M^4$  is similar to  $M^3$  but is larger. The  $M^5$  differs from  $M^4$  in that the hypoloph is narrower than the protoloph.

Dentary. A groove runs from below the anterior end of  $M_2$  to  $P_2$  in the holotype. The mandibular symphysis is weakly-ankylosed. The mental foramen is situated approximately 6 mm anterior of the anterior root of  $P_2$  on the holotype. The ventral margin of the dentary is almost straight.

The  $I_1$  is enamelled buccally with a distinct and well-developed flange of enamel ventrally and dorsally. A thin veneer of enamel is present ventrolingually. The tooth is high dorsoventrally and narrow buccolingually.

The  $P_2$  consists of a simple, straight blade with an anterior and posterior cuspid. It has two smaller cuspules and associated ridgelets between them. There is a very slight posterolingual flexion of the crest.

The  $P_3$  is an elongate tooth consisting of a main crest of even height, possessing a posterior and anterior cuspid with three smaller cuspules and associated



ridges in between. Distinct buccal and lingual ridges run to the crown base from the anterior cuspid. There is a slight posterolingual flexion of the crest. The tooth is slightly constricted about one quarter of the way anteriorly from its posterior end.

Lower molars. The anterior cingulum of  $M_1$  is narrow and high. A nearly straight paracristid is present near the buccal edge of the anterior cingulum. Further buccal to the paracristid is a slight extension of the anterior cingulum. Lingually, the anterior cingulum is bounded by a strong premetacristid. The protolophid, which is narrower than the hypolophid, is weakly-formed. The metaconid and, to a lesser extent, the protoconid form distinct prominences. The cristid obliqua runs from the hypoconid to the posterior face of the protoconid. A slight postmetacristid and even weaker preentocristid tend to block the lingual interlophid valley. The entoconid and, to a lesser extent, hypoconid form distinct prominences on the hypolophid. The rear face of the hypolophid is vertically oriented and unornamented. The  $M_2$  differs from  $M_1$  in the following ways: it is larger; it lacks a premetacristid; the paracristid is shifted more lingually and is concave buccally rather than being straight; the cristid obliqua is also more concave buccally and more centrally placed than on  $M_1$ ; the conids are of a more equal height; and the postmetacristid is absent. The  $M_3$  differs from  $M_2$  mainly in being larger and in possessing a slight pit on the rear face of the hypolophid (on the holotype only). The  $M_4$  is similar to  $M_3$  except that it is larger. The  $M_5$  is larger than  $M_4$  and has a slightly narrower hypolophid than protolophid, but is otherwise similar.

*Discussion.* *Kurrabi maboneyi* and *K. merriwaensis* are very similar in dental morphology, differing mainly in premolar size and details of anterior molar morphology. The difference in premolar size between these forms may indicate a dietary difference, *K. maboneyi* with its larger premolars possibly being capable of severing larger twigs and leaves than *K. merriwaensis*.

*Kurrabi merriwaensis* n. sp.  
(Figures 3-4; Table 3)

*Holotype.* AM F64014, left dentary fragment containing  $P_2$ ,  $P_3$ ,  $M_{1-4}$ . The dentary is broken away anterior to the  $P_2$  and posterior to  $M_4$ .

*Referred specimens.* AM F59570, left fragmentary dentary containing  $P_3$ ,  $M_{2-5}$ . AM F59531, right dentary fragment containing  $P_3$ ,  $M_{2-5}$ . AM F64015, left dentary fragment containing  $P_3$ ,  $M_1$ . AM F64032, left  $P_3$ . AM F59590, right maxillary fragment containing  $P^3$ ,  $M^{2-5}$ . AM F64013, left maxillary fragment containing  $P^2$ ,  $P^3$ ,  $M^{1-3}$ . AM 640115, right maxillary fragment containing a fragmentary  $P^3$ ,  $M^{2-4}$ .

*Diagnostic features.* *Kurrabi merriwaensis* can be distinguished from *K. maboneyi* in that the premolars are shorter absolutely and relative to molar size, the pre- and postparacrista are better-developed on anterior upper molars and the premetacristid on  $M_1$  does not contact the anterior edge of the anterior cingulum.

TABLE 3. Dental measurements of *Kurrabi merriwaensis* n. sp. from the Bow local fauna. L = length, AW = anterior width, PW = posterior width.

		L	AW	PW
F 64013	P <sup>2</sup>	9.3	4.4	5.5
	P <sup>3</sup>	12.8	3.3	6.4
	M <sup>1</sup>	8.9	6.2	6.8
	M <sup>2</sup>	9.3	7.6	7.7
	M <sup>3</sup>	10.8	7.8	
F 59590	P <sup>3</sup>	12.2	4.1	5.9
	M <sup>2</sup>	9.4		
	M <sup>3</sup>	10.3		8.5
	M <sup>4</sup>	11.4		7.4
	M <sup>5</sup>	12.1	9.0	
F 60115	M <sup>1</sup>	8.3	6.6	6.6
	M <sup>2</sup>	8.8	7.4	7.0
	M <sup>3</sup>	11.0	8.2	7.8
F 64032	P <sup>3</sup>	11.2	3.2	3.6
F 64015	P <sup>3</sup>	11.0	3.2	3.2
	M <sub>1</sub>	8.0	4.7	5.1
F 64014				
(Holotype)	P <sub>2</sub>	7.8	3.0	3.0
	P <sub>3</sub>	11.1	2.9	3.7
	M <sub>1</sub>	8.2	4.6	5.3
	M <sub>2</sub>	10.4	6.1	6.5
F 59531	P <sub>3</sub>	10.0	3.0	3.2
	M <sub>2</sub>	8.1	5.2	5.7
	M <sub>3</sub>	9.0	6.4	6.6
	M <sub>4</sub>	10.9	7.6	7.6
	M <sub>5</sub>	11.9	7.5	6.7
F 59570	P <sub>3</sub>	10.0	3.3	3.3
	M <sub>2</sub>	8.3		
	M <sub>3</sub>	9.9	6.8	6.7
	M <sub>4</sub>	10.2	7.5	7.6
	M <sub>5</sub>	11.8	7.7	7.0

*Type locality and age.* As for *Kurrabi mahoneyi*.

*Etymology.* This species is named in honour of the Merriwa Shire Council employees who have been very helpful to the various expeditions from the University of New South Wales and the Australian Museum. In particular, the help and support of Mr Greg Coulson and Mr I. Tiley given to the staff and students of the U.N.S.W. during the previous five years is most gratefully acknowledged.

*Description.* The Maxilla. Maxillary fragments reveal that *Kurrabi merriwaensis* most probably had a non-fenestrate palate (the median edge of the palate is unknown). The infraorbital foramen opens above the junction of P<sup>3</sup> and M<sup>2</sup>. The masseteric process is prominent and composed solely of the maxillary.

The P<sup>2</sup>. The P<sup>2</sup> is elongate with a straight main crest and a posterolingual cusp. The main blade consists of an anterior and posterior cusp with a strong



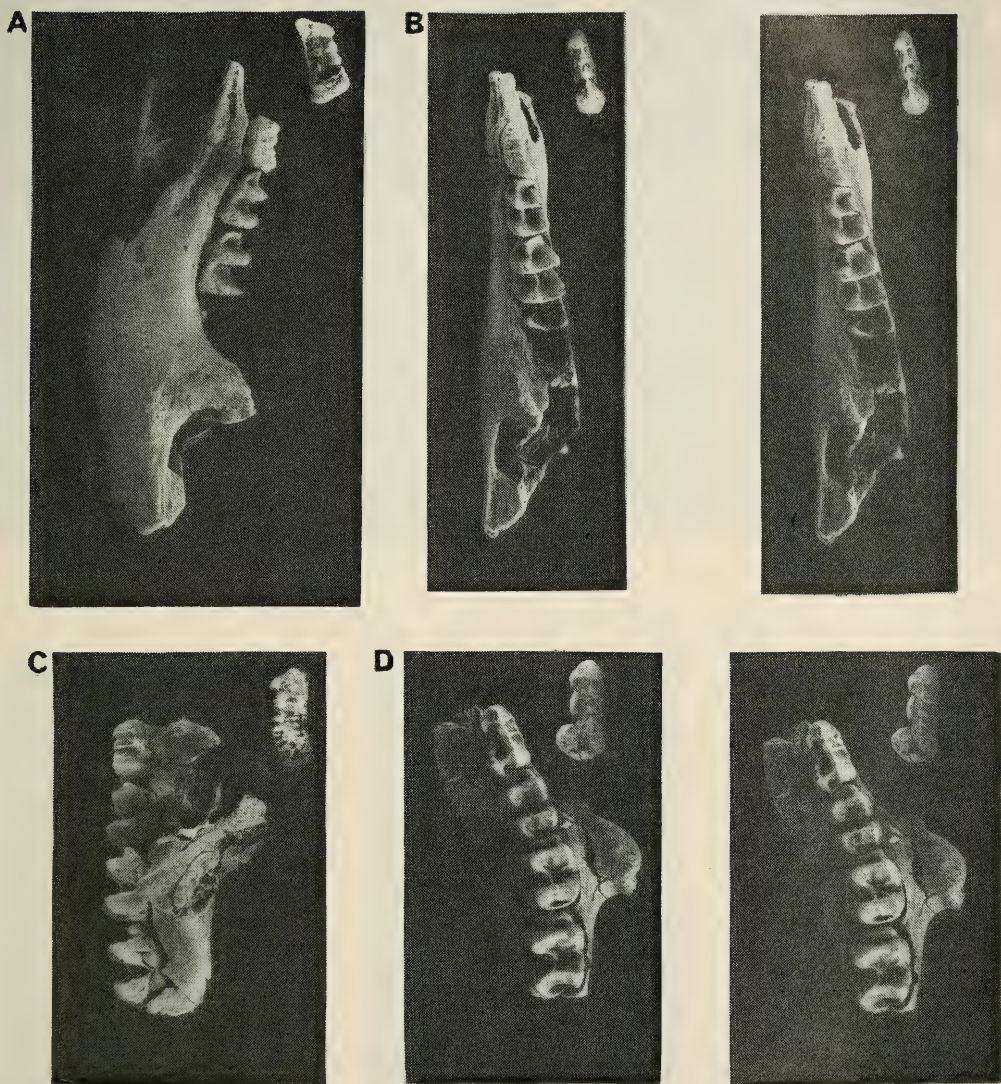


Fig. 3. A, lingual view of holotype of *Kurrabi merriwaensis* (AM F64014), containing  $P_2$ ,  $P_3$  (removed from crypt),  $M_{1-2}$ ,  $M_{3-4}$  in crypt, X1. B, stereopair of occlusal view of same specimen, X1. C, lingual view of AM F64013, juvenile left maxillary fragment of *K. merriwaensis* containing  $P_2$ ,  $P_3$  (removed from crypt),  $M_{1-3}$ , X1. D, stereopair of occlusal view of the same specimen, X1.



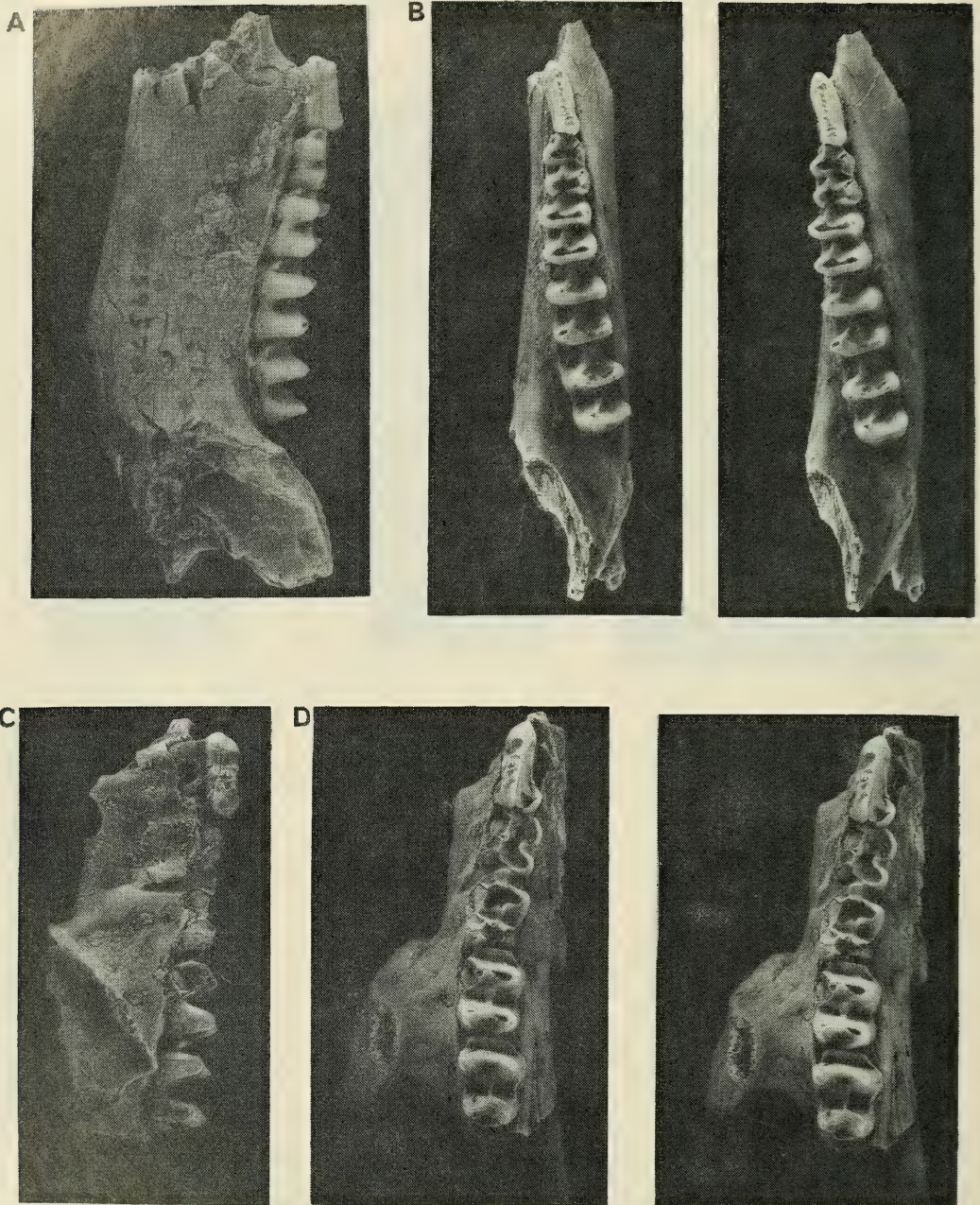


Fig. 4. A, lingual view of AM F59570, adult dentary fragment containing  $P_3$ ,  $M_{2-5}$  of *Kurrabi merriwaensis*, X1. B, stereopair of occlusal view of the same specimen, X1. C, lingual view of AM F59590, adult maxillary fragment containing  $P^3$ ,  $M^{3.5}$  of *K. merriwaensis*, X1. D, stereopair of occlusal view of the same specimen, X1.



ridge and associated cuspule between. A moderately well-developed lingual cingulum extends from the posterolingual cusp to opposite the anterior cusp. The lingual cingulum is formed of small tubercles and is markedly constricted two-thirds of the way from its posterior end. The posterolingual cusp is approximately one-half the height of the main crest and is attached to it by a well-developed, straight anterior crest and a weaker posterior crest, which first runs posteriorly, then turns sharply buccally. A large posterior fossette is enclosed by these ridges.

The  $P^3$ . The  $P^3$  consists of a main blade and a posterolingual cusp. The blade consists of a prominent anterior and posterior cusp with three smaller cuspules and associated ridgelets in between. The posterolingual cusp is two-thirds the height of the main blade. A small cuspule is present posterolingual to the main blade and posterobuccal to the posterolingual cusp. The low, rounded lingual cingulum ends anteriorly opposite the anterior cusp.

Upper molars. The protoloph of  $M^1$  is weakly-developed, possessing a paracone and metacone that form distinct prominences. The paracone is higher than the protocone and possesses a distinct preparacrista that joins the anterior cingulum. A small forelink is present anterior to the protocone. The anterior cingulum extends to near the lingual edge of the tooth. A very well-developed postparacrista joins a well-developed premetacrista to block the buccal end of the narrow interloph valley. However, a small portion of the valley extends buccal to this. The midlink originates from the protocone and terminates in the centre of the anterior face of the hypoloph. The posthypocrista is very well-developed and joins a near vertical postmetacrista. A small postlink is present on the rear face of the hypoloph, slightly closer to the metacone than the hypocone. The  $M^2$  differs from  $M^1$  in the following ways: it is larger; the preparacrista is more weakly-developed; the protoloph is more strongly-developed; the postparacrista and premetacrista are less well-developed and shifted slightly more medially; the anterior cingulum is more restricted lingually; the forelink is absent; the midlink has a fissure near its posterior end (this area is obscured by wear on  $M^1$ ) suggesting that its posterior portion is a contribution from the hypoloph; and the postlink is much more weakly-developed. The  $M^3$  differs from  $M^2$  in the following ways: it is larger and the preparacrista is less well-developed; the postparacrista and premetacrista are also more weakly-developed; and the postlink is absent. The  $M^4$  is larger than  $M^3$ . It lacks a preparacrista and the postparacrista and premetacrista are further reduced or absent relative to  $M^3$ . The  $M_5$  is similar to  $M_4$  except that the hypoloph is narrower than the protoloph.

Dentary. The dentary is unknown anterior to  $P_3$ . The position of the mental foramen and the morphology of the ascending ramus are also unknown. A slight buccinator groove is present extending from a position below the posterior end of  $M_2$  to just anterior to  $P_3$  on the buccal side of the dentary. The ventral border of the dentary of the holotype is almost straight but it turns dorsally posterior to the erupted molar row.



The  $P_2$  forms an elongate blade which is slightly convex buccally with a distinct posterolingual flexion. There is a distinct anterior and posterior cuspid with two smaller cuspules and associated ridges between.

The  $P_3$  is larger than  $P_2$  but is of an essentially similar morphology. It differs in being straighter and in the posterior cuspid being slightly more bulbous. As with  $P_2$ , two small cuspules are present between the anterior and posterior cuspid. In AM F64032, a small third cuspule is developed posterior to the other two.

Lower molars. The  $M_1$  possesses a narrow anterior cingulum, slightly more so in AM F64015 than AM F59570 or AM F59531. The paracristid is well-developed and runs from the metaconid to near the buccal side of the anterior cingulum. The preprotocristid is strongly developed but stops well short of the anterior end of the anterior cingulum. The metaconid and, to a lesser extent, the protoconid form distinct prominences on the protolophid which is narrower than the hypolophid. The cristid obliqua is well-developed, running across the deep interlophid valley. It originates from the hypoconid and joins the posterior portion of the metaconid. The entoconid and, to a lesser extent, the hypoconid form distinct apices on the hypolophid. There is a very slightly-developed prehypocristid.  $M_2$  differs from  $M_1$  in the following ways: it is markedly larger; the paracristid is more strongly-concave buccally; the preprotocristid is absent; the protolophid is the same width as the hypolophid; the conids do not form such prominent apices on the lophid margins; the cristid obliqua joins the posterior face of the protolophid further lingually and is more concave buccally; the prehypocristid is reduced in strength but retained as a small fold of enamel in the lingual side of the interlophid valley; and a very slight depression is present on the posterior face of the hypolophid. The  $M_3$  differs from  $M_2$  in the following ways: it is larger; the prehypocristid is slightly less distinct; the conids at the loph corners are less prominent. The  $M_4$  is larger than  $M_3$  but is otherwise similar. The  $M_5$  is more elongate and narrow than  $M_4$  and the hypolophid is reduced in size. The width of the anterior cingulum varies considerably on the known specimens of *K. merriwaensis*. On AM F59531, the anterior cingula are broader on the posterior molars than on other specimens and possess a distinct anteroposteriorly-oriented ridge on their buccal margins.

*Discussion.* *Kurubi merriwaensis* is most similar to an unnamed species of *Kurubi* from the Hamilton local fauna (Flannery *et al.* in prep.). These two species differ mainly in the degree of hypsodonty of the molars. However, the Hamilton form has much lower-crowned molars with a more weakly-developed cristid obliqua and paracristid. This may indicate that it is a more primitive species than *K. merriwaensis*, or that it occupied a different habitat, or both. The Hamilton local fauna suggests a rainforest habitat (Turnbull and Lundelius 1970, Flannery *et al.* in prep.) while the Bow local fauna suggests a savannah woodland or open forest.

*Protemnodon* Owen, 1874

*Protemnodon chinchillaensis* Bartholomai, 1973.

(Figure 5A,B)

**Material.** AM F64034, left dentary containing  $P_3$ ,  $M_{2-5}$ . AM F59549, left dentary fragment containing  $M_2$ . AM F59537, left dentary fragment containing  $M_3$ . AM F64036, right lower molar. AM F64041, AM F64040 and AM F64037, lower molar fragments. AM F64039 and AM F64044, lower premolar fragments. AM F59533, left maxillary fragment containing  $P^3$ ,  $M^{2-3}$ . AM F59530, left maxillary fragment containing  $M^{2-5}$ . AM F59606, left maxillary fragment containing  $M^{3-4}$ . AM F64035, right maxillary fragment containing fragmentary  $M^{3-5}$ . AM F64042, right  $M^3$ . AM F64038, upper molar fragment. AM F64043 and AM F64045, upper premolar fragments. AM F60118 and AM F59610,  $I^1$ 's of *Protemnodon* sp. cf. *P. chinchillaensis*.

**Diagnostic features.** This material is most similar in size and morphology to *Protemnodon chinchillaensis*. It can be distinguished from *P. buloloensis* by its larger size and more bulbous  $P_3$ . It lacks the postlink present on the anterior upper molars of *P. otibandus*. It has lower-crowned molars and is smaller than *P. roechus*, *P. brebus*, *P. devisi* and *P. anak*. It can be distinguished from *P. devisi* and *P. snewini* by possessing proportionately longer premolars relative to molar length (see Fig. 5A, B, Table 1).

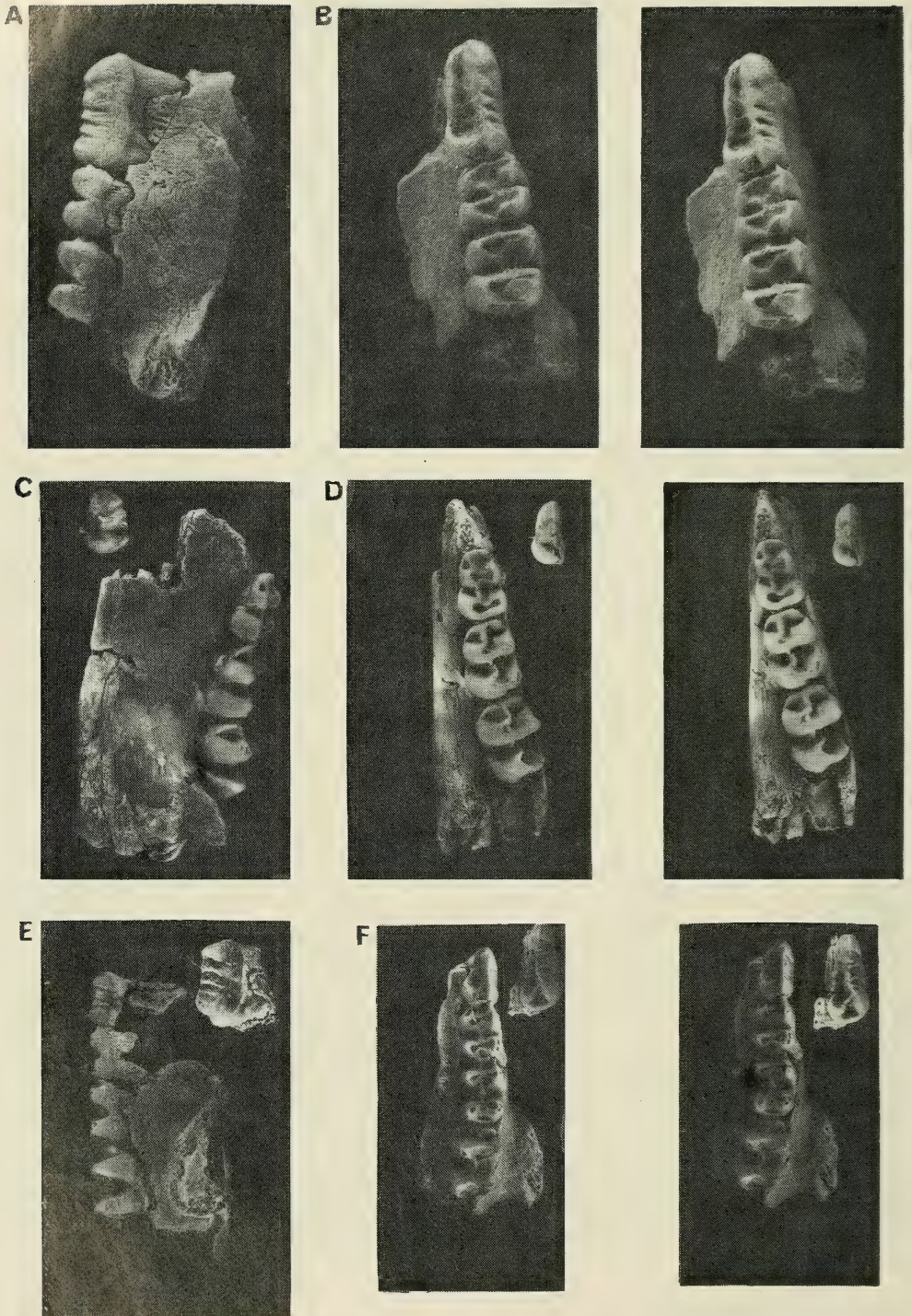
**Discussion.** The  $I^1$ 's tentatively referred here to *P. chinchillaensis* are robust and very similar in shape to the  $I^1$  of *P. anak*. They are too large to belong to either *K. mahoneyi* or *K. merriwaensis*. Both specimens possess a heavily worn crown and a thick root which is oval in cross-section. Enamel is restricted to the anterior surface of the tooth. The wear facet ascends the tooth in a gentle postero-dorsal arc. This arcuate-shaped wear facet appears to be the result of the anterior enamel face being more resistant to abrasion than the dentine.

In the course of comparing the Bow material of *P. chinchillaensis* to that of other species of *Protemnodon*, the specimen tentatively referred to *P. otibandus* by Plane (1972) from the early Pliocene marine Jemmy's Point Formation, Victoria, was re-examined. We found that it lacks the postlink that is present on the anterior upper molars of *P. otibandus*, but absent in *P. chinchillaensis*. This is the only feature of the Jemmy's Point specimen that allows for referral to *P. chinchillaensis* rather than *P. otibandus*. For this reason, it is here referred to *P. chinchillaensis* Bartholomai, 1973. The Jemmy's Point specimen represents the third locality record of *P. chinchillaensis* (the others being at Bow, N.S.W. and Chinchilla, Qd) and a considerable geographic range extension.

cf. *Protemnodon* sp.

**Material.** A single tooth fragment, AM F64006, may represent a second species of *Protemnodon* in the Bow local fauna. It is the central portion of the main crest of a left  $P^3$ , lacking the anterior and posterior ends and the lingual cingulum.







*Description.* This specimen is much larger than an equivalent fragment from *P. chinchillaensis*. Buccally, three coarse ridglets, separated by "U"-shaped depressions, are restricted to near the apex of the cutting crest. Lingually, a further three coarse ridglets are present but extend further towards the tooth base. The lingual side of the fragment slopes less steeply to the base than does the buccal side.

*Discussion.* Although this fragment appears to represent a distinctive species, it is too incomplete to permit confident taxonomic appraisal.

*Macropus* Shaw, 1970  
*Macropus dryas* (DeVis, 1895)  
(Figure 5E,F)

*Material.* AM F59546, left dentary containing a fragment of the  $P_3$ ,  $M_{2-3}$  and a talonid of  $M_4$ . AM F59535, left maxillary fragment containing  $P^2$ ,  $P^3$ ,  $M^{1-3}$ . AM F64064, left  $M^3$ . AM F64065, right  $M^2$ .

*Diagnostic features.* This material has been assigned to *Macropus dryas* for the following reasons: the premolars are elongate and the lingual cingulum of the  $P^3$  is reduced to a series of low tubercles; the molars are high-crowned; the upper molars invariably possess well-developed forelinks; the rear face of the hypophid of the lower molars is convex with no ornamentation; the anterior cingulum is high; and the paracristid and cristid obliqua are well-developed (see Fig. 5E,F). In possessing a combination of these characteristics, the Bow material closely resembles *M. dryas* and is distinct from other macropodoid species.

*Discussion.* The genus *Macropus* is currently under revision by Dawson and Flannery (in prep.). The subgeneric affinities of *M. dryas* are at present uncertain.

The Bow specimens of *M. dryas* are slightly smaller than the *M. dryas* material from Allingham reported by Bartholomai (1978), both samples of which contain smaller individuals again than the *M. dryas* sample from Chinchilla (Bartholomai 1975). AM F59546, the dentary, is rather poorly-preserved and the molars of this specimen rise into occlusion steeply, a characteristic not well-developed in any figured specimens of *M. dryas* reported by Bartholomai (1975, 1978). Although tenuous, the smaller size of the Allingham and Bow material may be further evidence of a closer temporal relationship between the Bluff Downs and Bow local faunas than between the Bow and Chinchilla local faunas (see Table 1).

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Fig. 5. A, lingual view of AM F59533, left maxillary fragment containing  $P^3$ ,  $M^{2-3}$  of *Protemnodon chinchillaensis*, X1. B, stereopair of occlusal view of the same specimen, X1. C, lingual view of AM F64033, left dentary fragment containing  $P_3$  (removed from crypt),  $M_{1-3}$  of *Macropus (Osphranter) pavana*, X1. D, stereopair of occlusal view of the same specimen, X1. E, lingual view of AM F59535, left maxillary fragment containing  $P^2$ ,  $P^3$  (removed from crypt),  $M^{1-3}$  of *Macropus dryas*, X1. F, stereopair of occlusal view of the same specimen, X1.

*Macropus (Osphranter)* Gould, 1842  
*Macropus (Osphranter) pavana* Bartholomai, 1978  
 (Figure 5C,D)

*Material.* AM F59534, left dentary fragment containing P<sub>3</sub>, M<sub>3</sub>. AM F59573, left dentary fragment containing P<sub>3</sub>, M<sub>1</sub>, M<sub>3</sub>. AM F64033, left dentary fragment containing P<sub>3</sub>, M<sub>1-3</sub>. AM F59548, left dentary fragment containing M<sub>2-4</sub>. AM F59585, right dentary fragment containing M<sub>3-5</sub>. AM F64055, left dentary fragment containing M<sub>5</sub>. AM F59578, AM F64052 and AM F64046, lower molar fragments. AM F59536, right maxillary fragment containing M<sub>1-5</sub>. AM F64047, right maxillary fragment containing M<sub>3-4</sub>. AM F59532, left maxillary fragment containing M<sup>3</sup>. AM F64050, AM F64054, AM F64051, AM F64053, AM 64047 and AM F64048, isolated upper molars and tooth fragments.

*Diagnostic features.* In size and morphology these specimens most closely resemble *Macropus (Osphranter) pavana* from the Bluff Downs local fauna, north-eastern Queensland. Unfortunately, comparisons are hampered by the rarity of *M. (O.) pavana* remains at Bluff Downs. The Bow material differs from *M. (O.) woodsi* (apparently a closely related form) in the following ways: it lacks the accessory cuspules on the median side of the interloph valleys; it has less well-developed forelinks on the upper molars; it has a more trenchant, blade-like P<sub>3</sub> which is not divided into discrete large cuspules.

*Discussion.* Some differences exist between the Bow and Bluff Downs samples of *Macropus (Osphranter) pavana*. On the three upper molars assigned to *M. (O.) pavana* from Allingham, a well-developed forelink is present. Such a structure can be distinguished on only three of the nine molars assigned to *M. (O.) pavana* from Bow. However, in several of the Bow specimens, a forelink (if present) may have been removed by wear. This difference is not considered significant at the species level because forelink development is variable in the living species of *M. (Osphranter)* (Flannery 1981) and because the sample size for *M. (O.) pavana* is extremely small. A single P<sub>3</sub> of *M. (O.) pavana* is known from Allingham. This specimen has a single small cuspule between the larger anterior and posterior cuspids. All three specimens of P<sub>3</sub> of *M. (O.) pavana* from Bow have two small cuspules in this position. The number of cuspules between the anterior and posterior cuspids on P<sub>3</sub> of *M. giganteus* and *M. fuliginosus* have been shown to vary between zero and one (Bartholomai 1971, Flannery 1981), so this difference also is not considered sufficient to recognise a separate species for the Bow material. The P<sub>3</sub> of F64033 from Bow differs from the other specimens in possessing a tall posterobuccal cuspid which is separated from the main crest by a deep fissure (see Fig. 5C,D). This is considered to represent an abnormal specimen because it differs so radically from the P<sub>3</sub> of other specimens.

Macropodinae indet. Type 1

*Material.* A left dentary fragment AM F64001, containing a partial M<sub>3-4</sub>, represents a small macropodine in the Bow local fauna.



*Description.* The dentary is markedly narrow buccolingually; below the anterior end of  $M_3$  it is narrower than the base of the crown of that tooth. A groove, originating below the anterior end of  $M_4$ , runs anteriorly under  $M_3$  on both the buccal and lingual sides of the dentary. No detailed morphology can be seen on  $M_3$  because it is too worn and broken. The  $M_4$ , however, lacks only the metaconid. Both lophids are breached by wear. The anterior cingulum is low and relatively broad. The paracristid, which originates near the protoconid (the exact relationship being obscured by wear) and ends in the anteromedial portion of the anterior cingulum, is strongly-developed. The cristid obliqua runs from near the hypoconid (the exact relationship being obscured by wear) to the medial part of the rear face of the hypolophid. The lophids are wider at the apex than the base. No posterior cingulum can be seen. However, if it was a small structure it could have been obliterated by the large interdental wear facet developed on the rear face of the hypolophid.

*Discussion.* Although it is clear that this specimen belongs to a species of macropodine approximately the size of *Macropus rufogriseus*, it is too fragmentary to permit other than subfamilial determination.

#### Macropodinae indet. Type 2

*Material.* A tiny protoloph (AM F64008), possibly of an  $M^2$ , and two tiny hypolophids (AM 64009 and AM F64010) represent a macropodine of approximately the size of *Dorcopsulus vanheurni*.

*Description.* The protoloph fragment is unworn and low-crowned. The apex of the protoloph is markedly narrower than its base. A small preparacrista joins buccal end of the anterior cingulum. The anterior cingulum becomes indistinct near the lingual loph margin. The protoloph apex is convex anteriorly. The post paracrista and postprotocrista are well-developed. They approximate and almost meet in the medial part of the base of the posterior side of the protoloph. The hypolophid fragments lack a posterior cingulum and possess a weakly-developed cristid obliqua that originates at the hypoconid. A rounded preentocristid is also present.

*Discussion.* These specimens represent the smallest macropodoid from Bow but, because of their fragmentary nature, they cannot be assigned to a genus.

### DISCUSSION

An extremely diverse macropodoid assemblage, consisting of sixteen species (including hypsiprymnodontines, potoroinae, sthenurines and macropodines) is represented in the Bow local fauna. *Troposodon bowensis* Flannery and Archer, 1983 is the most abundant species, followed in order of abundance by *Kurrabi mahoneyi*, *K. merriwaensis*, *Macropus (Osphranter) pavana* and *Protemnodon chinchillaensis*. A species of *Propleopus*, a small species similar to *Dendrolagus*, a potoroine and a fragment not assignable to genus (but distinct from other taxa in the fauna), are the rarest elements, being represented by a single specimen

each. Most of the common forms possess hypsodont molars and elongate premolars. Living species with a similar dental morphology (e.g. *Macropus agilis*) inhabit woodland and savannah. The abundance of these forms, combined with the presence of a species of *Macropus* (*Osphranter*), all the living species of which inhabit rocky areas or dry regions, suggest that the Bow local fauna is derived from a woodland/savanna habitat.

Where related species exist at Bow and Hamilton, such as *Kurrabi merriwaensis* and the unnamed species of *Kurrabi* from the Hamilton local fauna (Flannery *et al.* in prep.), the Bow form has the more hypsodont molars. The Hamilton fauna is believed to represent a rainforest habitat (Turnbull and Lundelius 1970; Flannery *et al.* in prep.). A few of the rarer elements in the Bow fauna, such as the brachydont species referred to cf. *Dendrolagus*, may indicate a rainforest component. Given the rarity and fragmentary nature of the remains of brachydont kangaroos in the Bow local fauna and the fluvial depositional environment, these possible rainforest elements may have been transported some considerable distance before coming to rest at the Bow site.

Because the Bow local fauna cannot be dated radiometrically, faunal comparisons must be used to date the site. Similarities exist between the kangaroos of the Bow local fauna, the Hamilton local fauna (dated at 4.46 mybp), the Bluff Downs local fauna (dated at 4.45 mybp) and the Chinchilla local fauna (undated by radiometric techniques). Although no kangaroo species are shared between the Bow and Hamilton local faunas, several striking similarities can be seen at higher taxonomic levels. Morphologically similar specimens referred to cf. *Dendrolagus* found at both of these sites are not known from any other Pliocene localities. Also, the species of *Kurrabi* are at present unique to the Bow and Hamilton local faunas. In particular, *K. merriwaensis* and an unnamed species from Hamilton appear to be closely related.

Similarities between the kangaroos of the Bluff Downs and Bow local faunas are also marked. *Macropus dryas* is found in both sites. It is also found at Chinchilla but the Bluff Downs and Bow forms are of a similar small size (see Table 1 and Bartholomai 1975, 1978). *Macropus* (*O.*) *pavana* is at present known only from the Bluff Downs and Bow local faunas. *Macropus* (*O.*) *woodsii*, an apparently closely related form, occurs at Chinchilla. If the current view that Bluff Downs is older than Chinchilla is accepted (e.g., see Archer and Wade 1976), then *M.* (*O.*) *pavana* may well be ancestral to *M.* (*O.*) *woodsii*. Both the Bow and Bluff Downs local faunas share small, primitive species of *Troposodon* not found elsewhere (*T. bluffensis* and *T. bowensis*). Also, more widely ranging species such as *Troposodon minor*, which is also found at Chinchilla and Bluff Downs, may be present at Bow (Flannery and Archer 1983).

Similarities between the kangaroos of the Bow and Chinchilla local faunas are less marked than between those of the Bow and Bluff Downs or Hamilton local faunas. Only one species, *Protemnodon chinchillaensis*, is seen at Chinchilla

and Bow but not at Hamilton or Bluff Downs. However, *P. chinchillaensis* is also found in the early Pliocene Jemmy's Point Formation, Victoria (see *P. chinchillaensis* discussion) and thus may be more widespread than previously suspected.

Overall, the greatest similarities of the Bow kangaroos lie with those of the Hamilton and Bluff Downs local faunas. Thus, the Bow local fauna is considered to be probably early Pliocene in age. Differences between these macropodid assemblages may be the result of slight temporal, geographic and/or habitat differences.

### CONCLUSIONS

Sixteen species of macropodoids, including hypsiprymnodontines, potoroines, thenurines and macropodines are found in the Bow local fauna of central eastern New South Wales, Australia.

The dental morphology of most species indicate a savanna and/or woodland habitat but a few poorly-preserved specimens may represent rainforest forms. These latter are few in number and represented by very fragmentary remains. Given the fluviatile nature of the deposit, they may have been transported some distance before being incorporated in the deposit.

The Bow fossil kangaroo assemblage most closely resembles those of the Hamilton and Bluff Downs local faunas and is thus interpreted to be early Pliocene in age.

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## APPENDIX 1

Appendix 1 lists all macropodoid dental remains from Bow not mentioned in the text or other publications. All are Australian Museum fossil specimens. Molars, dentary or maxillary fragments belong to *Kurrabi mahoneyi* and/or *K. merriwaensis*.

PLIOCENE KANGAROOS FROM THE BOW LOCAL FAUNA, N.S.W.

AM F64050-2, AM F64056-63, AM F64064-73, AM F64075, AM F64077-81, AM F64083-7,  
AM F64089-90, AM F59587, AM F59568, AM F59549, AM F59538, AM F59586, AM F59571,  
AM F59579, AM F59565, AM F59574, AM F59550, AM F59582, AM F64162, AM F64233,  
AM F64296.

Isolated molars or fragments of other species which cannot be closely identified.

AM F64092-120, AM F59613, AM F59568, AM F59583, AM F60116, AM F64234-48.

Isolated premolars and fragments.

AM F64249-64295.

Isolated lower incisors.

AM F59553, AM F59541, AM F59559, AM F59589, AM F59533, AM F59552, AM F59591,  
AM F59543, AM F59580, AM 64021-49.

Isolated upper incisors or premaxilla fragments.

AM F59612, AM F59554, AM F64297-64323.

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